

## CLAIMS

- 1 1. An arbiter circuit for resolving a plurality of N request signals received from a plurality  
2 of agents requesting access to a resource, said arbiter circuit comprising:  
3 a token distribution circuit responsive to a first clock signal defining a grant cycle, and  
4 providing a plurality of token priority signals, said distribution circuit being operative to assert a  
5 prioritized one of said token priority signals upon each said grant cycle;  
6 means forming a token ring; and  
7 a plurality of N grant devices coupled together by said token ring, each of said grant  
8 devices being responsive to a corresponding one of said request signals, to a corresponding one  
9 of said token priority signals, and to a corresponding token carry signal, each of said devices  
10 being operative to assert a grant signal if a corresponding request signal is asserted and either a  
11 corresponding token priority signal or a corresponding token carry signal is asserted.
- 1 2. An arbiter circuit as recited in claim 1 wherein a particular token carry signal received by  
2 a particular one of said devices is provided by an adjacent one of said devices via said token ring  
3 means, and wherein said particular token carry signal is asserted by said adjacent device if a  
4 request signal received by said adjacent device is not asserted and either a token priority signal  
5 received by said adjacent device or a token carry signal received by said adjacent device is  
6 asserted.
- 1 3. An arbiter circuit as recited in claim 1 wherein said token distribution circuit comprises  
2 an N-bit shift register having a plurality of N flip-flops each having an output providing one of  
3 said token priority signals, and wherein one of said flip-flops is preset to an active value, and the  
4 remainder of said flip-flops is preset to an inactive value.
- 1 4. An arbiter circuit as recited in claim 1 wherein:  
2 each of said grant devices is operative to generate a corresponding token propagate signal  
3 in response to a corresponding request signal, and also operative to generate a corresponding

4 token generate signal in response to a corresponding token priority signal and a corresponding  
5 request signal; and

6 said token ring means includes a token look ahead device operative to generate said token  
7 carry signals in response to said token propagate signals and said token generate signals, said  
8 token look ahead device for increasing the operational frequency of said arbiter circuit.

1 5. An arbiter circuit as recited in claim 4 wherein:

2 each of said grant devices is also operative to assert a corresponding token propagate  
3 signal provided that a corresponding request signal is de-asserted; and

4 each of said grant devices is further operative to assert a corresponding token generate  
5 signal if a corresponding token priority signal is asserted while a corresponding request signal is  
6 de-asserted.

1 6. An arbiter circuit as recited in claim 4 wherein said token look ahead device includes a  
2 circuit token carry input coupled to receive one of said token carry signals via a feed back path.

1 7. An arbiter circuit as recited in claim 5 wherein  $N=4$ , wherein said token look ahead  
2 device is operative to provide four token carry signals, and wherein:

3 a first one of said token carry signals is provided to a second one of said four grant  
4 devices in response to a token propagate signal provided by a first one of said four grant devices,  
5 a token generate signal provided by said first grant device, and a fourth one of said token carry  
6 signals;

7 a second one of said token carry signals is provided to a third one of said four grant  
8 devices in response to token generate signals provided by said first and second grant devices,  
9 token propagate signals provided by said first and second grant devices, and said fourth token  
10 carry signal;

11 a third one of said token carry signals is provided to a fourth one of said four grant  
12 devices in response to token generate signals provided by said first, second, and third grant  
13 devices, token propagate signals provided by said first, second, and third grant devices, and said  
14 fourth token carry signal; and

15       said fourth one of said token carry signals is provided to said first grant device in  
16   response to said token generate signals provided by each of said grant devices, said token  
17   propagate signals, and said fourth token carry signal.

1    8.     An arbiter circuit for use in a network switch for resolving a plurality of N request signals  
2    received from a plurality of agents requesting access to a resource, said arbiter circuit  
3    comprising:

4       a token distribution circuit responsive to a first clock signal defining a grant cycle, and  
5    providing a plurality of token priority signals, said distribution circuit being operative to assert a  
6    prioritized one of said token priority signals upon each said grant cycle;

7       means forming a token ring; and

8       a plurality of N grant devices coupled together by said token ring, each of said grant  
9    devices being responsive to a corresponding one of said request signals, to a corresponding one  
10   of said token priority signals, and to a corresponding token carry signal, each of said devices  
11   being operative to assert a grant signal if a corresponding request signal is asserted and either a  
12   corresponding token priority signal or a corresponding token carry signal is asserted.

1    9.     An arbiter circuit for use in a network switch as recited in claim 8 wherein said resource  
2    includes a packet routing table.

1    10.    An arbiter circuit for use in a network switch as recited in claim 8 wherein said resource  
2    is a network output port.

1    11.    An arbiter circuit for use in a network switch as recited in claim 8 wherein a particular  
2    token carry signal received by a particular one of said devices is provided by an adjacent one of  
3    said devices via said token ring means, and wherein said particular token carry signal is asserted  
4    by said adjacent device if a request signal received by said adjacent device is not asserted and  
5    either a token priority signal received by said adjacent device or a token carry signal received by  
6    said adjacent device is asserted.

1 12. An arbiter circuit for use in a network switch as recited in claim 8 wherein said token  
2 distribution circuit comprises an N-bit shift register having a plurality of N flip-flops each having  
3 an output providing one of said token priority signals, and wherein one of said flip-flops is preset  
4 to an active value, and the remainder of said flip-flops is preset to an inactive value.

1 13. An arbiter circuit for use in a network switch as recited in claim 8 wherein:  
2 each of said grant devices is operative to generate a corresponding token propagate signal  
3 in response to a corresponding request signal, and also operative to generate a corresponding  
4 token generate signal in response to a corresponding token priority signal and said corresponding  
5 request signal; and  
6 said token ring means includes a token look ahead device operative to generate said token  
7 carry signals in response to said token propagate signals and said token generate signals, said  
8 token look ahead device for increasing the operational frequency of said arbiter circuit.

1 14. An arbiter circuit for use in a network switch as recited in claim 13 wherein:  
2 each of said grant devices is also operative to assert a corresponding token propagate  
3 signal provided that a corresponding request signal is de-asserted; and  
4 each of said grant devices is further operative to assert a corresponding token generate  
5 signal if a corresponding token priority signal is asserted while a request signal is de-asserted.

1 15. An arbiter circuit for use in a network switch as recited in claim 13 wherein said token  
2 look ahead device includes a circuit token carry input coupled to receive one of said token carry  
3 signals via a feed back path.

1 16. An arbiter circuit for resolving a plurality of N request signals received from a plurality  
2 of agents requesting access to a resource, said arbiter circuit comprising:  
3 a token distribution circuit responsive to a first clock signal defining a grant cycle, and  
4 providing a plurality of token priority signals, said distribution circuit being operative to assert a  
5 prioritized one of said token priority signals upon each said grant cycle; and

6 a plurality of N grant devices each being responsive to a corresponding one of said  
7 request signals, to a corresponding one of said token priority signals, and to a corresponding  
8 token carry signal provided by an adjacent one of said grant devices, each of said devices being  
9 operative to provide a grant signal if a corresponding request signal is asserted and either a  
10 corresponding token priority signal or a corresponding token carry signal is asserted.